

Supporting Information

**Structural Colour Patterns by Electrohydrodynamic Jet Printed
Photonic Crystals**

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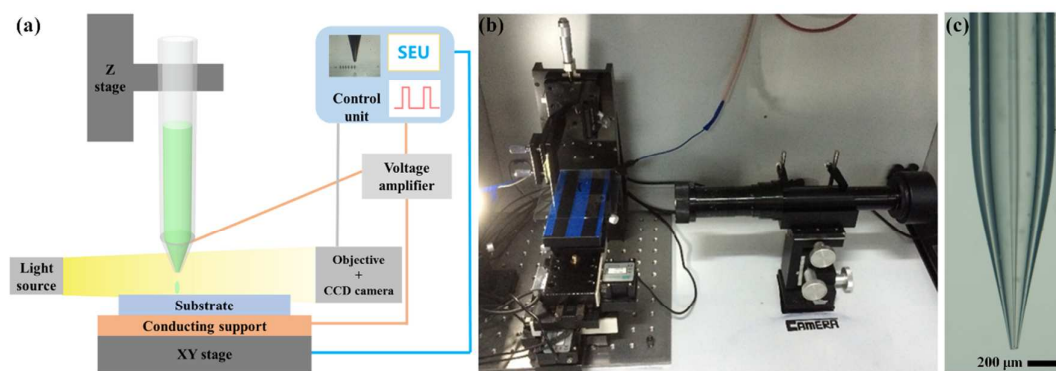


Figure S1. (a) Schematic illustration of the E-jet printer. There is a necessary electrical connection between the voltage and the voltage amplifier in continuous jet mode. (b) Photograph of the E-jet printer for pulsating jet mode. A homemade capillary nozzle was used in this mode. (c) Optical image of the capillary nozzle.

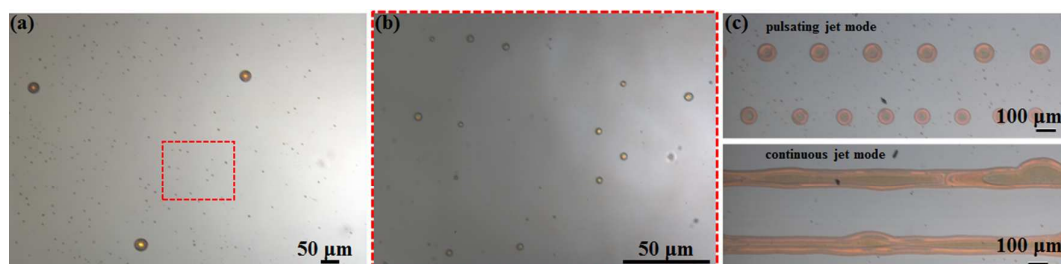


Figure S2. (a) Optical images of the PhC dots fabricated by using DI water as the solvent. (b) Magnification images of the PhC dots in (a). (c) Optical images of the PhC rings and lines fabricated by using butanediol as the solvent.

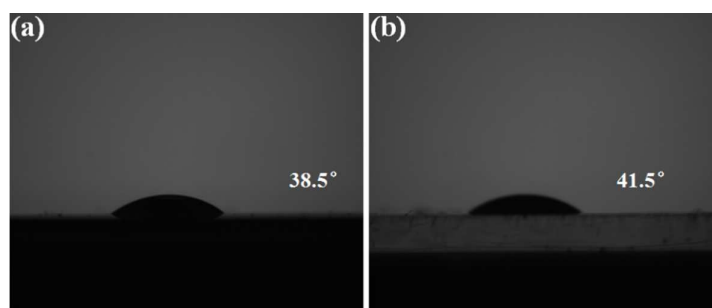


Figure S3. Images of EG droplet (2 μL) on a silica wafer (a) and an ITO glass (b).

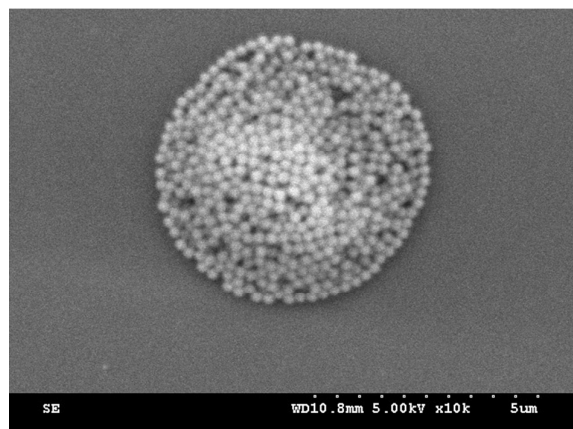


Figure S4 SEM image of a PhC dot when printing the colloidal crystal ink with a concentration of 0.02 g/ml.

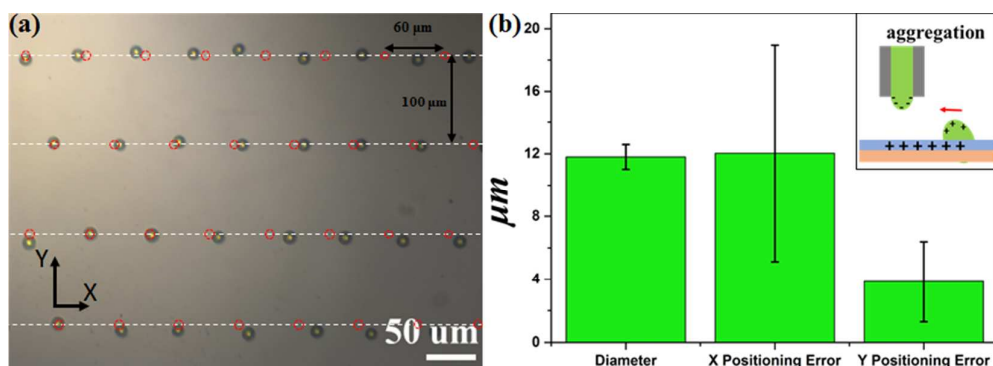


Figure S5 (a) The predesigned location of each dot in Figure 4f. The X direction was the movement direction of the stage. The original intervals were 60 μm in X direction and 100 μm in Y direction, respectively. (b) Statistical analysis of the diameter of the droplets and positioning accuracy in (a). The inset explained the reason of the positioning error in the movement direction of the stage.

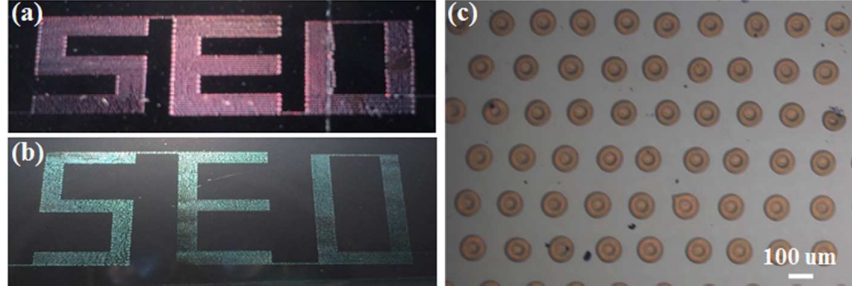


Figure S6 (a) Photograph of letter pattern “SEU” with red color. (b) Photograph of letter pattern “SU” with green color. (c) Optical image of the PhC rings in (a).

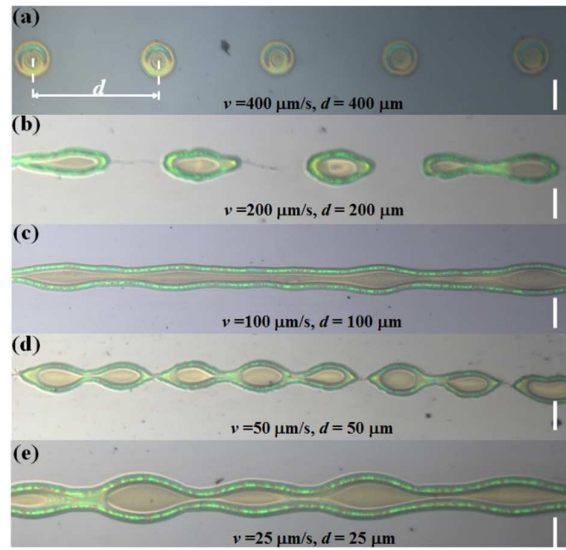


Figure S7 PhC lines fabricated by pulsating jet mode. (a - e) Optical images of the PhC patterns obtained at different velocity of the translation stage: (a) 400 $\mu\text{m/s}$, (b) 200 $\mu\text{m/s}$, (c) 100 $\mu\text{m/s}$, (d) 50 $\mu\text{m/s}$, and (e) 25 $\mu\text{m/s}$, respectively. All scale bars refer to 100 μm .

For E-jet printing in pulsating jet mode, only one droplet in a cycle was ejected by using the colloidal crystal ink. In this case, the distance (d) between two neighboring droplets on the substrate is:

$$d = v/f,$$

where v is the velocity of the translation stage. As there was a narrow range of frequency for printing colloidal crystal inks, the velocity of the translation stage could be regulated to control the footprints of patterns. To clarify the influence of different intervals for the coalescence of ink droplets, we carried out a series of tests of v . ITO glasses were considered to be suitable substrates for the coalescence of droplets since droplets would merge into larger ones on the hydrophobic surfaces such as Teflon layers. A capillary with an inner diameter of 127 μm was used as the nozzle. A pulse voltage signal with a frequency of 1 Hz (working potential of 1.3 kV with a duty cycle of 15% and a bias potential of -0.1 kV) was supplied to the conducting support. Optical images of PhC patterns consisting of droplets that are printed at different velocity are shown in Figure S7. When the velocity was so fast that the droplet was positioned too far to interact with the neighboring one, droplets dried and generated isolated rings (Figure S7a). With the decrease of velocity and interval, isolated drops overlapped and started to merge (Figure S7b). A smooth PhC line could be printed at a proper velocity where the nanoparticles preferred to assemble at the edge of the lines due to the coffee-ring effect. (Figure S7c). However, if the velocity was too slow, bulging along the lines will happen after the coalescence of droplets (Figure S7d and S7e).

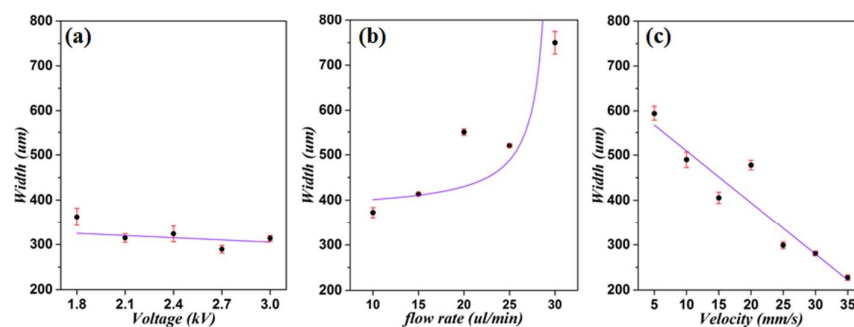


Figure S8 Correlation between the widths of the lines and the parameters of E-jet printing in continuous jet mode: (a) the voltage of power supply, (b) the flow rate of syringe pump, and (c) the velocity of translation stage. The nozzle-to-substrate distance is 1500 μm and the internal diameter of the meal nozzle is 500 μm .

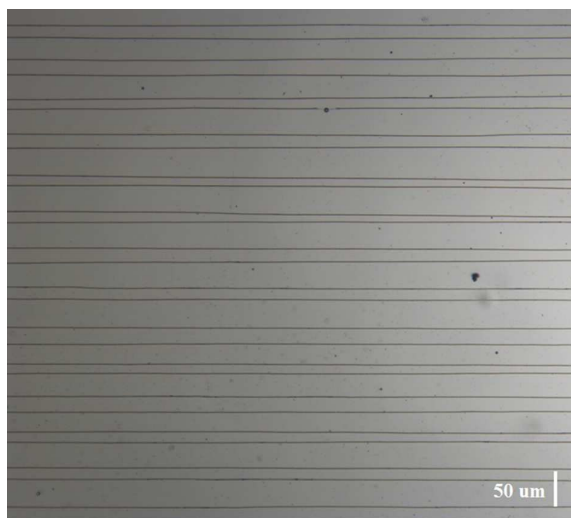


Figure S9 Optical images of the printed PEO lines in continuous jet mode. A solution of 5% (w/v) PEO ($M_w = 600\,000\text{ g mol}^{-1}$) in DI water was prepared as the ink.